PTS/Data Highway Interface Software
User's Manual

Issue 2

February 1997

MAN527

Contents

1. Introduction 1

2. Program Functions 2

3. Programming 3
3.1 General 3
3.2 Register Size 3
3.3 Files and Messages 3
3.4 Protocol 3

4. Configuring the PTS 4
4.1 Software License Key 4
4.2 Serial Port 5
4.3 Data Highway Protocol 5

5. Address Map 6
5.1 System Data 7
5.2 Channel Data 9

6. Error Codes 12

7. Register Bit Mapping 13
7.1 Status Word Register 13
7.2 Input/Output Registers 14

Copyright © 1997 Quin Systems Limited

1. Introduction

This manual relates to the following versions of software in the Mini-PTS and PTS Mark 2 units:

Data Highway Interface	Version 1.1
PTS Host software	Version 1.8.2 or later

This document describes the PTS/Data Highway Interface. This provides considerable flexibility in operating the machine - allowing changes to the program to be made quickly and easily by the user. It also ensures that improvements to the standard PTS product can be readily incorporated into any machine. The PTS units use the Quin Motor Control language which is described fully in the relevant PTS Reference Manual.

Control of the machine is accomplished in the following way:

- The control system communicates with the PTS unit as if it were a PLC. This allows the control system to display information about the running of the machine which it gets from the PTS. In a similar manner the operator can control the machine from the control system.
- The PTS unit controls the running of the motors according to setup data received from the control system. The interface to the control system is via the auxiliary serial port, thus leaving the main serial port available for initial machine setup and diagnostics.
- It is envisaged that most of the digital I/O such as guard switches will be taken care of using a PLC.

Copyright © 1997 Quin Systems Limited

2. Program Functions

The Data Highway interface to the PTS allows the control system to control and monitor the operation of the machine by communicating with the PTS directly over a RS232 or RS422 serial link.

The functions which the PTS/Data Highway interface accomplishes are as follows:

- Monitoring machine status. The control system can interrogate the PTS to determine whether any motor errors have occurred, or to find the current channel status for example. It is also possible to examine the current setting of parameters such as the velocity, position, etc.

- Machine control. The control system can control the PTS by initiating preprogrammed sequences. It is also able to execute most of the normal PTS commands such as setting the velocity, executing a move and so on.

Machine control and monitoring are achieved from the control system by reading from/writing to registers within the PTS in the same way as a PLC would be controlled and monitored. The communication with the PTS is done using the Data Highway DF1 protocol. Registers are 16-bit locations for input and/or output. The PTS interface maps the registers onto standard PTS commands in a predetermined manner thus allowing the operator to accomplish most of the things that are possible using the standard PTS command language.

Copyright © 1997 Quin Systems Limited

3. Programming

3.1 General

The Data Highway interface to the PTS is designed to make the PTS look like a PLC as much as possible. To achieve this, the PTS appears as a number of registers or elements which can be read or written as appropriate by the control system using the Data Highway interface. Each PTS channel has its own set of registers to allow random access to most of the data in the PTS. In addition there is a set of registers for system-wide data which is not specific to a particular channel. It is possible to address the channel data in two ways. Using the standard method, consecutive registers access different data items from the same channel. Using the alternative method, consecutive registers access the same data item on different channels.

3.2 Register Size

It should be noted that the Data Highway DF1 protocol can only handle 16 bit numbers and therefore the units on the PTS must be set to ensure all data falls within this range. This is accomplished with the SU command.

3.3 Files and Messages

The PTS appears to a remote system as a single file which contains all the registers as elements in the file. The PTS ignores the file number contained in incoming messages and will therefore accept messages addressed to any given file.

The PTS recognizes the following PLC-5 messages.

Word Range Write (Block Write) (function code 00)
Word Range Read (Block Read) (function code 01)
Typed Write (function code 67)
Typed Read (function code 68)

The PTS accepts logical Binary addresses or logical ASCII addresses of the form:

`$Nff:eee`

where `ff` is the file number which is currently ignored
and `eee` is the element or register number as descibed in the following pages.

3.4 Protocol

The PTS is intended to be connected to the Data Highway network using the KF2 interface module or equivalent. The PTS recogniozes the Data Highway Full Duplex DF1 protocol and can be configured to use either RS232 or RS422 serial port characteristics. The serial line parameters are as follows.

9600 Baud
8 bit characters
1 stop bit
No parity

Copyright © 1997 Quin Systems Limited

4. Configuring the PTS

4.1 Software License Key

The software for the Data Highway interface will not operate unless a software key has been entered to enable this option. The software key is different for each PTS and can be obtained from your sales office given the system serial number which can be found by using the SK command as shown below. Note that all options which use the second serial port are mutually exclusive. These options are the standard Operator's panel, Mini Operator's panel, the Modbus interface and the Data Highway interface.

To enable the software the following command should be entered on Port A (the main programming port) in privileged mode. You enter the text in **bold** while the PTS displays something similar to the rest.

```
1> SK
Serial number: 006545
Feature     Version   Key
New feature ? datahw
Version ? 1.1
Key ? abcd
OK
```

Note that the feature name (datahw) must be entered in lower case exactly as shown above. Note also that it is necessary to turn the power off and back on again to run the Data Highway software.

If the software needs to be disabled, first make a note of the software key in case it is needed in the future. Then proceeed as above but simply press the Return key in response to the "Version ? " prompt as follows.

```
1> SK
Serial number: 006545
Feature     Version   Key
datahw        1.1     ABCD
New feature ? datahw
Version ?
Feature datahw removed
```

Copyright © 1997 Quin Systems Limited

4.2 Serial Port

The Data Highway interface uses Port B of the PTS which can be configured to be either RS232 or RS422 levels using a PTS command on the Mini-PTS 2+1, Mini-PTS 3 and PTS Mark 2. To change the serial port configuration the following command should be entered on Port A (the main programming port) in privileged mode. You enter the text in **bold** while the PTS displays something similar to the rest.The example demonstrates changing Port B from RS232 to RS422.

```
1> CF
Port  Configuration
 A    RS232     S/W
 B    RS232     N/A
 D    Stn  1    BCC
Port ? B
Type ? RS422
OK
```

4.3 Data Highway Protocol

Certain details of the Data Highway protocol implementation can be configured using the CF command to change the configuration of Port D. These are the station number of the PTS on the Data Highway network and the type of checksum used on messages to and from the PTS. It is important to set these parameters correctly to ensure that the PTS recognizes commands sent to it and reponds correctly to those commands. The following example demonstrates changing the station number to 1 and the checksum type to CRC (the default values).

```
1> CF
Port  Configuration
 A    RS232     S/W
 B    RS485     N/A
 D    Stn  5    BCC
Port ? D
Station number ? 1
Checksum type (BCC or CRC) ? CRC
OK
```

Copyright © 1997 Quin Systems Limited

5. Address Map

The data is organized in read/write registers as shown on the following pages. Each piece of data is accessible at two addresses. The first addressing mode allows different data items on the same channel to be accessed at consecutive addresses. The channel number is shown by the hundreds digit and is represented by "nn" in the tables. Addresses below 100 are used for system-wide data items which are not specific to a particular channel. The second addressing mode is used for addresses above 5000, and allows the same data item on all channels to be accessed at consecutive addresses.

For example the control word (CW) for channel 1 can be accessed as register 106, the control word for channel 3 can be accessed at address 306 and so on. If multiple registers are written starting at register 106, then this will alter the control word (CW), debounce time (DB), zero marker input (DZ) etc. for channel 1. The control word for channel 1 can also be accessed as register 5251, for channel 2 at 5252, for channel 3 at 5253 and so on. The debounce time for channel 1 can be accessed at 5301, for channel 2 at 5302 and so on. This addressing mode is useful because it allows a given data item for all channels to be accessed using a single communications block and so uses the network more efficiently. The register number is given in the tables first for addressing mode 1 (data item consecutive) and secondly for addressing mode 2 (channel consecutive).

It should be noted that certain commands are marked in the tables as write only and will therefore not return a meaningful value when read.

Copyright © 1997 Quin Systems Limited

5.1 System Data

Address	Command	Contents
2	AS	Start-up sequence number
3	CD	Character delay
4	CH	Current channel (Write only)
5	DW	Display word
6	GX	Command abort (Write only)
7		Reserved
8	XS	Execute sequence (Write only)
9	CP	Parallel channel command (Write only)
10	SY	Set status reporting
11	$V1	Variable V1
12	$V2	Variable V2
13	$V3	Variable V3
14	$V4	Variable V4
15	$V5	Variable V5
16	$V6	Variable V6
17	$V7	Variable V7
18	$V8	Variable V8
19	$V9	Variable V9
20	$V10	Variable V10
21	$V11	Variable V11
22	$V12	Variable V12
23	$V13	Variable V13
24	$V14	Variable V14
25	$V15	Variable V15
26	$V16	Variable V16
27	$V17	Variable V17
28	$V18	Variable V18
29	$V19	Variable V19
30	$V20	Variable V20
31	$V21	Variable V21
32	$V22	Variable V22
33	$V23	Variable V23
34	$V24	Variable V24
35	$V25	Variable V25

Copyright © 1997 Quin Systems Limited

System Data (continued)

Address	Command	Contents
36	$V26	Variable V26
37	$V27	Variable V27
38	$V28	Variable V28
39	$V29	Variable V29
40	$V30	Variable V30
41	$V31	Variable V31
42	$V32	Variable V32
43	$V33	Variable V33
44	$V34	Variable V34
45	$V35	Variable V35
46	$V36	Variable V36
47	$V37	Variable V37
48	$V38	Variable V38
49	$V39	Variable V39
50	$V40	Variable V40
51	$V41	Variable V41
52	$V42	Variable V42
53	$V43	Variable V43
54	$V44	Variable V44
55	$V45	Variable V45
56	$V46	Variable V46
57	$V47	Variable V47
58	$V48	Variable V48
59	$V49	Variable V49
60	$V50	Variable V50
81	CM	Compile sequences (Write only)
82	RD	Read parameters (Write only)
83	RS	Reset parameters (Write only)
84	ER	End repeat loop (Write only)
85	GA	Global abort command (Write only)
86	GF	Global motor-off command (Write only)
87	GS	Global stop command (Write only)
88	GX	Global command abort (Write only)

Copyright © 1997 Quin Systems Limited

5.2 Channel Data

Address		Command	Contents
nn02	50mm	AV	Set map base/offset adjustment velocity
nn03	51nn	BA	Set map base advance
nn04	51mm	BL	Set backlash compensation distance
nn05	52nn	BT	Set master speed averaging time constant
nn06	52mm	CW	Control word
nn07	53nn	DB	Debounce time
nn08	53mm	DZ	Define zero marker input on/off
nn09	54nn	IN	Initialise position (Write only)
nn10	54mm	IT	Integration time constant
nn11	55nn	KD	Differential gain
nn12	55mm	KF	Velocity feed-forward gain
nn13	56nn	KI	Integral gain
nn14	56mm	KM	Monitor output gain
nn15	57nn	KP	Proportional gain
nn16	57mm	KV	Velocity feedback gain
nn17	58nn	LH	High position limit
nn18	58mm	LL	Low position limit
nn19	59nn	MA	Move to absolute position (Write only)
nn20	59mm	MB	Map base offset
nn21	60nn	ME	Motor error sequence
nn22	60mm	MF	Slave map position offset
nn23	61nn	ML	Link to master channel for mapping (Write only)
nn24	61mm	MP	Map bound
nn25	62nn	MR	Move to relative position (Write only)
nn26	62mm	MS	Map step
nn27	63nn	MT	Map timeout
nn28	63mm	MW	Map options word
nn29	64nn	OC	Set value on expanded output group (Write only)
nn30	64mm	OM	Monitor output offset
nn31	65nn	PA	Set position trigger output advance
nn32	65mm	PV	Profile velocity
nn33	66nn	RF	Set reference offset
nn34	66mm	RL	Set reference repeat length
nn35	67nn	RT	Registration timeout

nn = channel number. mm = channel number + 50.

Copyright © 1997 Quin Systems Limited

Channel Data (continued)

Address		Command	Contents
nn36	67mm	RV	Reference velocity
nn37	68nn	RW	Reference word
nn38	68mm	SA	Acceleration
nn39	69nn	SB	Position overflow bound
nn40	69mm	SC	Creep distance
nn41	70nn	SD	Deceleration
nn42	70mm	SE	Error band
nn43	71nn	SF	Auxiliary output function
nn44	71mm	SJ	Deferred adjustment position
nn45	72nn	SL	Settling time
nn46	72mm	SM	Map scaling
nn47	73nn	SR	Maximum reference correction
nn48	73mm	SS	Creep speed
nn49	74nn	SU	Set units
nn50	74mm	SV	Velocity
nn51	75nn	SW	Window on move endpoint
nn52	75mm	TM	Transfer map (Write only)
nn53	76nn	TO	Move timeout
nn54	76mm	TP	Transfer profile (Write only)
nn55	77nn	UE	User error sequence
nn56	77mm	US	Send user signal (Write only)
nn57	78nn	VC	Enter constant velocity mode (Write only)
nn58	78mm	VM	Set virtual motor mode
nn59	79nn	VT	Set velocity averaging time constant
nn60	79mm	WC	Wait for bound overflow count (Write only)
nn61	80nn	XM	Execute map (Write only)
nn62	80mm	XP	Execute profile (Write only)
nn63	81nn	YA	Wildcard parameter A
nn64	81mm	YB	Wildcard parameter B
nn65	82nn	YC	Wildcard parameter C
nn66	82mm	YD	Wildcard parameter D
nn67	83nn	YE	Wildcard parameter E
nn68	83mm	YF	Wildcard parameter F
nn69	84nn	YG	Wildcard parameter G

nn = channel number. mm = channel number + 50.

Copyright © 1997 Quin Systems Limited

Channel Data (continued)

Address		Command	Contents
nn70	84mm	YH	Wildcard parameter H
nn71	85nn	YI	Wildcard parameter I
nn72	85mm	YJ	Wildcard parameter J
nn73	86nn	ZC	Set position counters (Write only)
nn74			Reserved
nn75	87nn	AB	Abort (Write only)
nn76	87mm	SO/CO	Output lines group 1
nn77	88nn	SO/CO	Output lines group 2
nn78	88mm	SO/CO	Output lines group 3
nn79	89nn	ID	Initialise demand position offset (Write only)
nn80	89mm	MO	Motor off (Write only)
nn81	90nn	PC	Position Control (Write only)
nn82	90mm	RM	Set continuous reference mode on/off
nn83	91nn	ST	Stop (Write only)
nn84	91mm	UL	Unlink (Write only)
nn85	92nn	DA	Display analogue input
nn86	92mm	DF	Display reference error
nn87	93nn	DP	Display actual position
nn88	93mm	DS	Display snapshot position data
nn89	94nn	DV	Display velocity
nn90	94mm	DD	Display demand position
nn91	95nn		Motor error code
nn92	95mm		User error code
nn93	96nn		Status word
nn94	96mm		Input group 1
nn95	97nn		Input group 2
nn96	97mm		Input group 3
nn97	98nn		Input group 4
nn98	98mm		Input group 5

nn = channel number. mm = channel number + 50.

Copyright © 1997 Quin Systems Limited

6. Error Codes

System error codes can be read from channel registers nn91 and nn92. These registers hold respectively the last motor error and last user error which occurred on channel nn. The codes are given in section 5.4 of the relevant PTS Reference Manual.

Copyright © 1997 Quin Systems Limited

7. Register Bit Mapping

7.1 Status Word Register

The meaning of the value in the Status word register (channel register nn93) are shown below.

Status Value

Value	Meaning when set
1	Waiting for time (WT)
2	Waiting for input line (WI)
3	Waiting for absolute position (WA)
4	Waiting for relative position (WR)
5	Waiting for reference signal (WR)
6	Waiting for bounds wraparound (WB)
7	Waiting for bounds counter value (WC)
256	Constant velocity mode (VC)
512	Moving (MA/MR)
1024	Profiling (XP)
2048	Mapping (XM)
4096	Stopping (ST)
8192	Initialising (IN)
16384	Torque control mode (TQ)
32768	Motor off

Copyright © 1997 Quin Systems Limited

7.2 Input/Output Registers

The bits in the output line registers (nn76 etc.) and the input line register (nn94 etc.) reflect the state of the input/output lines as shown below.

Input/Output Line Bits

Bit	Input/Output Line
0 (LSB)	Line 1
1	Line 2
2	Line 3
3	Line 4
4	Line 5
5	Line 6
6	Line 7
7	Line 8
8 .. 15	Reserved

Copyright © 1997 Quin Systems Limited